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The Distribution of Permeable Sensory Pegs on the Body of the Grasshopper (Orthoptera: Acrididae)

By ELEANOR H. SLIFER, Department of Zoology, State University of Iowa, Iowa City

It has been shown in an earlier paper (Slifer, 1954) that the longest of three types of basiconic sensory pegs [1] which are present on the antennae of the grasshopper is permeable at its distal tip to aqueous solutions of certain dyes. The occurrence of similar pegs on other parts of the body was noted in this article but an account of their distribution and relative frequency was not included. An examination of all portions of the body surface of two species of grasshoppers has now been completed and the results are recorded below.

MATERIALS AND METHODS

Newly-hatched nymphs and newly-molted adults of two species of grasshoppers which are common in this locality—*Melanoplus differentialis differentialis* (Thomas) and *Melanoplus mexi-*

[1] Jannone (1940) has described sense organs on many parts of the body of *Dociostaurus maroccanus* (Thunberg) and includes the long sensory pegs with the trichoid sensilla. Earlier Röhler (1906) studied very similar structures on the antenna of *Acrida turrita* (Linnaeus) and lists them as basiconic sensilla. Snodgrass (p. 43, 1926; p. 519, 1935) states that "there is no sharply dividing line between sensilla trichodea and sensilla basiconica." The present writer prefers to class the structures under discussion with sensilla basiconica because the cuticular part is so wide in proportion to its length as to suggest a peg rather than a hair. Moreover innervation is through a group of nerve cells instead of a single cell.

canus mexicanus (Saussure)—were used in the present study. The method employed was that described earlier (Slifer, 1954) either in its original form or with minor modifications. Living nymphs were usually immersed whole in an aqueous solution of 0.5% acid fuchsin while adults were sometimes treated whole and at other times separated into several pieces before being placed in the dye. No anaesthetic was used. At the end of 30 minutes, or a longer period, the insect, or part, was removed from the stain and dipped rapidly, and in succession, into distilled water, 70% alcohol and absolute alcohol to remove excess dye from the surface. It was then placed in n-butyl alcohol. At this point the specimen was dissected, if need be, and viscera, muscles and other soft tissues removed. Acid fuchsin is readily soluble in water and is lost quickly if there is any delay. Usually an entire specimen can not be dissected with sufficient speed to preserve the stain in all of the permeable pegs and those on the parts handled last will be uncolored. This difficulty was overcome by using a large number of insects and starting dissections in different regions. As each piece of body wall was isolated it was removed to a fresh dish of n-butyl alcohol where dehydration was completed. The parts were then cleared in toluol and mounted on slides in synthetic resin with the external surface uppermost. When successfully stained each peg is colored red at its tip. The distance to which the dye penetrates depends largely, although not entirely, upon the time of exposure.

Results and Discussion

Below are listed all those parts of the body surface on which permeable pegs have so far been found. No differences were noticed: (1) in the distribution of the pegs in the two species; (2) in the distribution on structures which are common to newly-hatched nymphs and adults; and (3) in the distribution on structures which are common to males and females.

Head

Antennae (scape, pedicel, each subsegment of flagellum)
Front, vertex, occiput, postocciput, genae, postgenae, clypeus

Labrum
Mandibles
Maxillae (galea, each segment of palp, palpifer, stipes, cardo)
Labium (glossa, paraglossa, each segment of palp, palpiger, mentum, submentum)

Thorax

Prothorax (pronotum or tergum, episternum, sternum, prosternal spine)
Prothoracic legs (coxa, trochanter, femur, tibia, each segment of tarsus,[2] arolium, base of claw)
Mesothorax (pleuron, sternum)
Mesothoracic legs (coxa, trochanter, femur, tibia, each segment of tarsus,[2] arolium, base of claw)
Mesothoracic wings or tegmina
Metathorax (tergum, pleuron, sternum)
Metathoracic legs (coxa, trochanter, femur, tibia, each segment of tarsus,[2] arolium, base of claw)
Metathoracic wings

Abdomen

Terga of segments I to X of both sexes
Sternum of segment VIII of female
Sterna of segments VIII and IX of male
Epiproct and paraprocts of both sexes
Cerci of both sexes
Furcula of male *Melanoplus m. mexicanus* (*Melanoplus d. differentialis* males lack a furcula)
Ovipositor valves and egg guides of female

The heat-sensitive antennal crescents of the face and the fenestrae of the thorax and abdomen present a special problem. A few permeable pegs may occur within their boundaries but since each peg is set on a small island of ordinary cuticle it is not easy to decide whether the peg is surrounded by the heat-sensitive area or is actually a part of it. For the present, such pegs have been listed as belonging to the body part on which the particular heat-sensitive area occurs.

[2] In a study of the tarsus and pretarsus of the grasshopper (Slifer, 1950), it was stated that none of the sense organs which are present on them is permeable to certain dyes. With the technique used at that time no staining could be seen, but with acid fuchsin it is now possible to demonstrate the presence of permeable pegs on both.

Although many specimens were examined no permeable pegs were found on the surface of the following structures:

Compound eyes
Ocelli
Tympanic membranes of first abdominal segment
Lacinia of the maxillae
Mesothoracic tergum
Cervicum
Pleural and intersegmental membranes of the abdomen

The permeable pegs, then, were found on all but a few of the body regions studied but their distribution is far from uniform on those parts where they occur. They are most numerous on the antennae. The labial and maxillary palps, legs, cerci and tegmina are generously provided with them and a fairly large number are present on the thoracic and abdominal sterna. At the other extreme, the pegs are found in very low numbers on the dorsal surface of the metathorax and on the metathoracic wings. No more than two or three pegs were found on the last-named structures in any individual and these only after a long search. The absence of permeable pegs on the surface of the compound eyes, ocelli and tympanic membranes is not surprising since these structures are already specialized as sense organs.

An examination of the data given above will show that the pegs occur on exposed surfaces and are scarce or absent altogether on those structures which are ordinarily folded or covered by other parts. The almost complete absence of pegs on the metathoracic wings is notable, for these wings, when not in use during flight, are folded like a fan and are covered by the tegmina as well. In contrast, the outer surface of each tegmen is provided with many pegs. The cervicum and the pleural and intersegmental membranes of the abdomen lack pegs and these are folded inwards much of the time. In adult females which are about to oviposit the membranes between abdominal sclerites may be stretched and exposed and the same is true of nymphs which are preparing to molt. These events, however, occupy relatively brief periods in the entire life of the insect. The cor-

relation, then, between the number of permeable pegs that is present on a particular region of the body and the degree to which that part is exposed to the general environment is a strong one.

It was suggested earlier (Slifer, 1954) that the ready penetration of the tips of these sense organs by dyes furnishes new support to the conclusions of earlier workers, based on other kinds of evidence, that basiconic pegs may function as chemoreceptors, as hygroreceptors or, perhaps, as both. Experimental and histological work on the pegs which is now in progress may, it is hoped, provide new data to clarify further the function and properties of these structures.

Summary

1. Permeable sensory pegs of the type described earlier for the antennae of the grasshopper are present on almost every region of the body surface which is in direct contact with the surrounding environment.

2. Pegs of this kind are most numerous on the appendages and are fewest, or absent entirely, on those regions which are usually folded together or covered by some other body part.

3. No pegs were found on the surface of structures which are already highly specialized as sense organs of another kind.

4. No differences were found in the distribution and number of the pegs on the two species studied or in males and females except where a structure present in one does not occur in the other.

5. Permeable pegs are present in the newly-hatched nymph on all those parts where they occur in the adult with the exception of structures which are still incompletely developed, such as the wings and external genitalia.

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A New Subspecies of Epargyreus clarus from Arizona with Distributional Notes (Lepidoptera: Hesperiidae)

By Bruce W. Dixon, Pittsburgh, Pennsylvania

While arranging the series of *Epargyreus clarus* Cramer in the collection of the Carnegie Museum, it was noticed that specimens from Arizona differed consistently from the material of other parts of the country. Upon investigation, certain other points, as well, were noted. The results of this study are presented below.

1. Type Localities of *Epargyreus clarus* Cr. and *tityrus* Fab.

Cramer, in his original description of *Papilio clarus* (1775, Pap. Exot. 1: 66, pl. 41, figs. E, F), gives Surinam as the type locality. All references to the South American occurrence of *clarus,* except a very few, seem to be traceable to the original citation by Cramer. In the large collection of the Carnegie Museum, I have not been able to find a single specimen of *clarus* from either Central or South America. A few records of the occurrence of *clarus* in Latin America, however, can be found in the literature. For example:

Evans (1952, Cat. Amer. Hesp. Brit. Mus. 2: 45–46) records three males and one female from Mexico (North Sonora), one male from Honduras, one male from Colombia, one male from Surinam, and one male from Brazil. Evans, himself, indicated that the specimens from Colombia, Surinam, and Brazil are of doubtful authenticity. This would suggest that Honduras was probably the extreme southern limit of *clarus,* and even this might be doubtful.

Hoffmann (1941, Ann. Inst. Biol. 12: 245) records *clarus* from Baja California and again from North Sonora. Taking into account the fact that both Evans and Hoffmann record *clarus* from North Sonora, it is quite possible that the species is well established there, and for all practical purposes Sonora might be considered the southern limit of *clarus.* The Baja California record is not of truly great significance, distribu-

tionally speaking, since it is a peninsula, but the population might be most interesting to examine.

Godman and Salvin (1898, Biol. Cent. Am. 2: 300) state that, so far as known to them, *clarus* does not occur in Central America.

Mr. E. L. Bell (*in litt.*) doubts that it occurs in South America at all.

From the above, there is obviously very strong reason to believe that the Surinam citation of Cramer is in error. Since it is highly desirable that a definite type locality exist for every specific name, I hereby designate as type locality of *Papilio clarus* Cramer: Dayton (Rockingham Co.), Virginia, based on a series of six males and two females in the Carnegie Museum (coll. by H. C. Will, June–August, 1931, C. M. Acc. No. 9140), on the assumption that Virginia, if not the most likely source of Cramer's material, is at least a very logical one.

Fabricius, in his description of *Papilio tityrus* (1775, Syst. Ent., p. 532), cites only America as type locality. This makes it possible to designate the same locality (Dayton, Va.) for *tityrus,* which is hereby done, and for the same reason.

2. Description of the New Subspecies

Epargyreus clarus huachuca subsp. nov.

On the upper surface *huachuca* differs primarily from *clarus* in that the golden spot in cell Cu_1 of the fore-wing is completely separated from the large spot in cell M_3. The length of the former spot along Cu_1 is much less in *huachuca,* and in one specimen (Arizona, Lindsey Coll'n) this spot is almost gone (0.4 mm.). In all male specimens of typical *clarus* examined, the latter spot is at least three times longer than the small spot in cell Cu_1 and always touches or overlaps the large spot.

On the underside, *huachuca* has the grey-violet areas along the outer margin enlarged and of a lighter grey color; the large silver spot on the hind wing is compressed laterally in *huachuca,* and the whitish lines which usually run along the outer margin

of this spot are often absent. The fringes, both on the upper and under surfaces, are decidedly darker in *huachuca* than in *clarus*.

Genitalically *huachuca* does not appear to differ consistently from *clarus* except that the lower region of the vinculum is slightly constricted as in *exadeus*.

Holotype, male, Huachuca Mts., Cochise Co., ARIZONA, June, 1940 (A. C. Twomey). *Allotype,* female, same data as holotype. Seven male and three female *paratypes,* same data as holotype; one male *paratype,* "Arizona" (Holland Coll'n); two male and two female *paratypes,* Garces, Arizona, July (Biedermann); two male *paratypes,* Williams Creek, Arizona, 26 May 1932 (Sweadner Coll'n); one female *paratype,* White Mts., Arizona, 7 July 1932 (Sweadner Coll'n); two female *paratypes,* Pinal Mts., Arizona, 29 July 1927 (E. Graham); two female *paratypes,* Chiricahua Mts., Arizona, 1–7 July 1940 (A. C. Twomey); one male, one female *paratypes,* "Arizona" (Edwards Coll'n); one male *paratype,* "Arizona" (Lindsey Coll'n).

All types C. M. Ent. type series no. 237. One pair of paratypes in my collection; all others in the Carnegie Museum.

A single male from New Mexico (Holland Coll'n, C.M., no further data) has been examined. It appears to be *huachuca,* but is so worn that identification is uncertain.

A very few specimens of *clarus* have been seen from "Washington Territory," Oregon, California, Colorado, Wyoming, and northern Utah. None of these are referable to *huachuca,* and I suspect, accordingly, that the new subspecies is probably confined to Arizona and the immediately adjacent region.

Size. Length of gold spot in cell Cu_1, fore-wing, along Cu_1 of holotype and eight male paratypes (mm.): 0.8, 0.9, 1.0 (2), 1.1, 1.2, 1.3, 1.4, 1.5, mean 1.13. The same for the allotype and eight female paratypes: 1.5 (2), 1.6, 1.7 (2), 1.8, 1.9, 2.0, 2.1, mean 1.75.

Amount of separation between spot in cell M_3 and spot in cell Cu_1, fore-wing, measured along Cu_1, of holotype and eight

male paratypes (mm.): 0.2, 0.3, 0.5, 0.8 (2), 1.3, 1.4, 1.9, 2.0, mean 1.02. The same for the allotype and eight female paratypes: 0.1, 0.2 (2), 0.4, 0.5 (2), 0.6, 0.7, –0.2,[1] mean 0.33.

Last, but not least, I wish to give thanks to Mr. Harry K. Clench of the Carnegie Museum, who was kind enough to let me study the museum series, and who was a loyal stand-by in times of despair. I also wish to thank Mr. E. L. Bell of Flushing, New York, and Dr. A. W. Lindsey of Denison University, both of whom furnished material on the southern limit of *clarus,* along with several other helpful suggestions.

Observations on Two Species of Phidippus (Jumping Spiders)

By Robert Snetsinger, Illinois Natural History Survey, Urbana

Direct field observations were made on species of Salticidae in study areas in central Illinois from 1951 to 1953. These areas were readily accessible and observations were made, depending to a considerable extent on the activities of the spiders, throughout the period. At mating and brooding time it was possible to keep individual records on series of individuals of some species. Observations were made and notes taken, much as life-history studies are made by bird students.

Phidippus audax (Hentz) and *P. rimator* (Walckenaer) were two of the most abundant species in the field edges, prairie remnants, prairie groves, and waste areas under observation. Both species appear to have similar life-histories, food requirements, nesting sites, and other niche requirements. This would apparently mean a direct clash for the basic niche requirements, except that differences in the seasonal timing of their activities (fig. 1) permit these two species to occupy the same area in apparent harmony. Accounts of life-histories of *P. audax* and *P. rimator* are combined here because of their similarities.

[1] In this specimen the spots *overlap* to the extent shown.

FIG. 1. Timetable showing activities of *P. audax* and *P. rimator* throughout season in central Illinois[1]

	P. audax		*P. rimator*	
	Arr.	Depart.	Arr.	Depart.
Spring activity starts	3/1†		4/†	
Mature males present	3/15*	6/23	6/8	8/17
Mature females present	5/5	6/19	6/21	11/9
Mating season	5/7	6/18	6/29	8/5
Eggs laying	6/14	7/27	8/24	10/17
Eggs hatching	6/28	8/6	9/3	10/27
Young leaving egg sacs	7/2	8/8	9/13	11/**
Immatures present outside egg sacs	7/2	6/14‡	9/13	8/20‡
End of activity (hibernation)		10–11†		11†

[1] Summary of three years. Peaks of activity are about in middle of arrival and departure times.

† Varies with weather.

‡ Of the next year.

* Often a few present in late fall.

** May not leave egg sac till winter or spring.

Individuals of *P. audax* are large, hairy, black salticids with a conspicuous central marking and several pairs of less distinct markings on the dorsum of the abdomen. These markings are white in mature individuals and red or orange in instars previous to maturity. The mature females are about 10 mm. to 14 mm. in length. The mature males are about 2 mm. shorter.

Individuals of *P. rimator* are also large, hairy, and black, but have a black dorsal band down the center of the abdomen. On each side of the black band is a series of white dots of hair-like scales. The forward edge of the band has a fringe of white scales in mature and close to mature specimens. The sides of the abdomen are brownish in the immatures, orange-brown in the mature females, and bright red in the mature males. The mature females are about 8 mm. to 11 mm. in length. The mature males are 2 mm. to 4 mm. shorter.

The eggs of *P. audax* and *P. rimator* are slightly over 1 mm. in diameter, yellowish in color, and laid in sacs about 10 mm. in diameter. The number of eggs in a sac varies with the size of the female, the number of previous clutches, and perhaps other

factors. One female *P. audax,* for example, laid 85, 42, and 28 eggs in three successive clutches. It would appear from other counts that the number of eggs in at least the first clutch varies with the individual more than with the species. In both species it takes 10 days for the eggs to hatch.

The young spiderlings remain inside of the egg sacs for about three to five days after they hatch. Some of the egg sacs were deliberately opened the first or second day after they hatched. The young spiders at this time had molted once. They bailed out of their egg sacs on their silk thread parachutes like veteran troopers. Normally they do not leave the egg sacs until they force their own openings to the outside world. Hence it is not unusual for spiderlings to molt more than once inside the egg sac. The activity of the spiderlings plays an important part in the length of time it takes for them to leave the egg sacs.

During bright, warm days the young spiders are active and crawl through and tear apart the threads of the egg sacs. The more active spiderlings force an opening to the outside and the others follow. Once they are out, they crawl up plants, fence posts, or whatever the nests are built on. When the young spiders reach a high point, they ancher their silk lines. Then they spin out silk threads and float away from their anchorages. Finally, the wind tears or breaks the threads loose and the spiderlings go sailing away like runaway kites. Some stay where the wind carries them; others climb up some other object and set sail again.

P. audax and *P. rimator* obtain their prey by stubbornly stalking it, suddenly jumping it, and finally subduing it with poison. At maturity, *P. rimator* can spring 5 to 7 inches and *P. audax* can spring 4 to 6 inches at one leap. Once they obtain their prey, they crush it and eat the juices and soft parts; they leave the hard parts. Both species are able to capture a vast number of orthopterous, dipterous, heteropterous, and homopterous insects. There were no observed differences in the diets of the two species. The season, the size of the spider, and the weather play a part in what is captured as food. The small salticids feed on small insects, usually near the ground. The larger salticids feed on larger insects higher off the ground.

After leaving the egg sacs, the spiderlings pass through an additional series of instars, each terminated by a molt. It was not possible to determine the precise number of molts for either species. It is hoped a careful measurement of a larger series of immatures collected at very short intervals throughout the year will eventually reveal this information. The molting periods are dangerous times in the lives of these two species. The first molts inside the egg sacs account for the death of about 15% of the spiderlings observed. Later molts also took their share of victims.

Molting takes place in special chambers built for this purpose. These chambers are made of silk, open up and down, and look like old-fashioned handmuffs. They are built on fence posts, shrubs, small trees, and other plants. The small salticids build very small chambers of a very few threads. The larger salticids build very strong chambers, which take many hours to weave. Such chambers are also used during other periods by *P. audax* and *P. rimator.*

One of these is the mating period. Courtship maneuvers are commenced by male *P. audax* and *P. rimator* almost immediately after their molt to adulthood. The males usually mature a week or 10 days before the females. They are 10% to 20% smaller than the females, probably due to one or more fewer molts. During this week or 10 days they wander about feeding, fighting other males of the same species, searching for mature females, and probably storing sperm in their copulatory organs. The latter, however, was never observed.

When the females become sexually mature, they enlarge the chambers they have used for their last molt or build new ones. The females of *P. audax* and *P. rimator* do not wander about during the courtship period; they wait for the males to come to their chambers. Some skittish females become frightened by the males during early courtships. These drive off the males or drop to the ground. However, these females return to the old chambers later or build new chambers. Early in the mating season an occasional male is found occupying a single chamber. This appeared to be the case of a confused male that had cap-

tured the mating chamber, but not the mate. They stay at such chambers for a day or two and then leave. The females wait in chambers for varying periods of time. Some leave their chambers and build new ones every few days until they get mates. Others just wait for the mates. One female *P. rimator,* with a chamber somewhat isolated from others, waited unsuccessfully 24 days for a mate. This spinster was really a spinster.

When a mature male locates a waiting chamber with an unpaired female occupant, he slowly climbs the fence post, plant, or whatever the chamber is on. The female then rushes out to meet him. The male continues to advance while threatening with his forelegs, pedipalpi, and body. If the female veers one direction, the male also veers to compensate for her movements; when she retreats, he advances; and if he is successful, he finally forces the female into her waiting chamber. He then climbs on top of the chamber, sometimes closes the ends with silk, and guards the female. The female is now virtually his prisoner. The male soon builds his own chamber on top of the female's. The two spend part of a week or more living together.

If another male attempts to obtain an already won female, a fight usually follows. One such battle occurred between a very small male *P. rimator* with a missing foreleg and a much larger normal male of the same species. The small male, with a missing leg, was resting in his chamber above his mate. The aggressor male slowly started to climb the fence post the mated pair was on. When he was within two feet of the chamber, the small male became aware of the aggressor. The defender rushed out to meet the aggressor. When the males met, they each gave a very strong threat display, locked their chelicerae and forelegs, and fought. The defender forced the aggressor to the ground, returned to his mate, gave a short display before her, and went into his upper chamber. The aggressor took a short rest after he was defeated and tried to sneak up again. He tried and was defeated four times in his attempts to obtain a stolen bride. The total time of the fight was about thirty

minutes. The defending males were the victors in the other observed fights. The upper position held by the defending males appeared to have a good deal of strategic importance.

The observed matings took place inside of the double chambers. When the female faced upward or downward in her chamber with her venter facing outward toward the male, he sometimes took this chance to hold her and mate. He held her against the back of her silk chamber so that she looked like a wrestler pinned to the mat. He then forced his pedipalpi through the silk layers that separated the two and inserted his palpal organs into the openings of epigynum of the female. They were observed to copulate for periods of 5 to 30 minutes. The pair separated and sometimes copulated again.

After the mating season breaks up, the males disperse and gradually disappear. The females continue to feed and within a few weeks are almost bursting with gravidity. At this time they seek small sheltered cavities for nesting sites. They then build silk chambers which serve as guardstations during nest-building, egg-laying, and guard duty over the egg sacs. The females weave packets of silk in which they lay their eggs. These egg sacs or packets are anchored near the chambers used for guardstations. The building of nests and the laying of eggs take about two days. After building nests, laying eggs, and fasting while guarding one or more clutches of eggs, the females are left in poor condition and soon die.

During the winter months many *P. audax* are found in aggregations in silk chambers under the bark of bur oak, hickory, and other loose-barked trees. *P. rimator* and also some *P. audax* are found individually overwintering under debris and about the base of plants. During warm winter weather these spiders sometimes become active.

The observed instances of contact between the two species were very few. This was related to the timetable (fig. 1) of the two species. When one species was using the nesting sites available in an area, the other was not nesting. When one was using the available mating chambers sites, the other was not mating. When the immatures of one species were feeding on

very small insects, the immatures or matures of the other species were much larger and ate much larger insects.

The observed contacts occurred when *P. audax* was nesting and *P. rimator* was mating. There was some overlap in the use of nesting and mating sites at that time. However, no competition was observed. Five cases were observed where a female *P. audax* and a pair of *P. rimator* lived within 1 to 3 feet of each other on the same fence post. The individuals often passed within 3 to 4 inches of each other without fighting; at most they made only slight threat displays and usually took no notice of one another. In each of these cases the broods and the matings appeared to be successful.

In some laboratory observations on captive adults there were many fatal fights between the two species and often fatal flights between males and females of the same species. If the female spiders were put into a container first and allowed to build chambers, there was less fighting. The safety of these chambers and a lack of confinement probably accounted for the want of observed fighting between *P. audax* and *P. rimator* when mating and nesting in close proximity under natural conditions.

Undescribed Species of Crane-flies from the Western United States and Canada (Dipt.: Tipulidae) Part XIV

By Charles P. Alexander, University of Massachusetts, Amherst, Massachusetts

The preceding article under this general title was published in Entomological News 63: 233–237, 267–271, 1952. The novelties considered herewith result chiefly from collections made by the author and his friends, Kenneth M. Fender and James Baker, in the Northwestern United States in 1953. The types of the new forms are preserved in my extensive collection of crane-flies.

Tipula (Oreomyza) idahoensis new species

General coloration of mesonotum brownish gray, the praescutum with a conspicuous central stripe, the posterior sclerites, with the pleura, clearer gray; wings tinged with brown, the obliterative area at cord conspicuous; R_{1+2} entire; abdomen obscure yellow, the tergites with three nearly continuous brown stripes; male hypopygium with the tergite entirely divided medially by pale membrane; phallosome conspicuous, the apophyses long and slender; ovipositor with the valves, especially the cerci, short and obtuse.

♂. Length about 14 mm.; wing 15 mm.; antenna about 4.6 mm.

♀. Length about 13 mm.; wing 10 mm.

Male. Frontal prolongation of head long, nasus very short and stout; palpi brownish black. Antennae moderately long, as shown by the measurements; scape and pedicel yellow, flagellum black; flagellar segments only moderately incised, longer than the verticils. Head brownish gray, with a conspicuous dark brown central stripe on vertex; vertical tubercle low.

Pronotum brownish yellow, narrowly darkened medially. Mesonotal praescutum brownish gray, clearer gray on sides, the median stripe broad, the sides narrowly darker than the central portion, lateral stripes barely indicated; posterior sclerites of notum gray, the scutellum with a barely indicated darker stripe. Pleura gray, vaguely patterned with paler gray; dorsopleural membrane yellow. Halteres pale brown, the knobs dark brown. Legs with the coxae light gray; trochanters yellow; femora obscure yellow, the tips narrowly and vaguely more darkened; tibiae obscure yellow, the tips very narrowly blackened; basitarsi brownish yellow, outer tarsal segments broken. Wings tinged with brown, the prearcular and costal regions more yellowed; stigma small, darker brown; obliterative area at cord white, conspicuous, separated from the small antestigmal brightening; veins black, paler in the more brightened fields. Squama without trichia. Venation: R_{1+2} entire; petiole of cell M_1 approximately three times *m;* cell *2nd A* relatively broad.

Abdomen obscure yellow, the tergites with three nearly continuous brown stripes, broken by the pale posterior borders, the lateral stripes widened on the outer segments, the lateral borders broadly clearer yellow; sternites weakly darkened medially, paler on sides. Male hypopygium with the ninth tergite separated from the sternite by a suture; basistyle narrow, entirely separate from the sternite. Ninth tergite, viewed from above, entirely divided by pale membrane, each half produced caudad into a narrowly obtuse darkened lobe, with an internal more pendant flattened blade that is best seen from the side. Outer dististyle long and narrow, a trifle widened outwardly. Inner dististyle massive, the large beak blackened, simple, narrowed to the obtuse tip; a very small dorsal crest at near midlength of posterior border of style; surface of style bearing a stout clavate lobe or rod. Phallosome conspicuous; aedeagus short, subtended by small lobes of about the same length, forming a shield-shaped area; lateral apophyses long and slender, weakly bent at near midlength, the tips obtuse. Eighth sternite narrowed posteriorly, the caudal border truncate, with two small and inconspicuous apical lobes separated from the sternite by membrane; setae of sternite sparse, lacking medially near apex.

Female. Characters generally in male but wings tending to be reduced. Ovipositor with valves short and blunt, especially the cerci which are shorter than the more slender pointed hypovalvae.

Habitat. IDAHO. *Holotype:* ♂, Toller Ditch, Payette National Forest, Valley County, altitude 6,000 feet, August 11, 1953 (Alexander and Baker). *Allotopotype:* ♀.

I cannot indicate any close ally of the present fly. Some features of the male hypopygium suggest the otherwise entirely different *Tipula* (*Lunatipula*) *snoqualmiensis* Alexander but there is no real affinity between the two flies.

Tipula (Oreomyza) albertensis fenebris new subspecies

♂. Length about 13–14 mm.; wing 14–15.2 mm.; antenna about 3.5–3.6 mm.

Characters as in typical *albertensis* Alexander, differing in the details of structure of the male hypopygium and other lesser features. Antennae a little longer, the individual segments correspondingly lengthened, approximately four times as long as thick; in *albertensis* about three to three and one-half times. Male hypopygium with the rostrum of the inner dististyle stouter, the apical margin somewhat sinuous; outer basal lobe with the blackened spinous points much reduced both in size and number. Gonapophysis with a single sclerotized point, the outer apical one of the typical form lacking.

Habitat. COLORADO. *Holotype:* ♂, Glacier Basin, Rocky Mountain National Park, altitude 8,350 feet, July 25, 1941 (C. P. Alexander). *Paratopotype:* ♂, July 23, 1941.

Ornithodes harrimani brevirostris new subspecies

♂. Length about 15 mm.; wing 14 mm.; rostrum about 0.5 mm.

Characters generally as in the typical form, differing as follows: Rostrum relatively short and stout, approximately one-half as long as the antenna or about two-thirds the remainder of head. In typical *harrimani,* rostrum longer than the remainder of head or approximately two-thirds the antenna. Venation: Cells R_4 and M_1 very short-petiolate; cell *1st* M_2 relatively short and broad, as compared with the typical form. Male hypopygium with the notch of the tergite very broad and shallow, exceeding twice the diameter of either lobe across its base. In *harrimani,* the tergite is narrowed posteriorly, the notch subcircular in outline, approximately as wide as either lobe at its base.

Habitat. NEVADA. *Holotype:* ♂, Tamarack Flats, Mount Rose Highway, altitude 8,100 feet, July 2, 1953 (C. P. Alexander).

The most southerly known records for typical *harrimani* Coquillett include Salt Creek Falls, Cascade Mountains, Oregon, and the vicinity of the Grand Tetons, Wyoming, both north of 43° North Latitude. The Mount Rose station is just south of 40° North Latitude.

Dactylolabis luteipyga new species

General coloration gray, the praescutum with four more or less clearly defined stripes, the intermediate pair approximated, in cases with their extreme anterior ends polished black; wings with a pale yellow tinge; male hypopygium yellowish brown to pale brown, conspicuously brighter than the remainder of abdomen; outer dististyle with a conspicuous tubercle on mesal face near base.

♂. Length about 7.5–8 mm.; wing 8–8.5 mm.

♀. Length about 10 mm.; wing 9 mm.

Rostrum and palpi black, the former pruinose. Antennae black throughout. Head light gray.

Thorax gray, the pleura clearer gray; praescutum with four more or less clearly defined brown stripes, the intermediate pair very approximated to nearly confluent, their extreme anterior ends in cases polished black. Halteres yellow, knobs weakly darkened. Legs with the coxae yellow, very sparsely pruinose, best indicated on bases of mid-coxae; trochanters yellow; femora brownish yellow, the tips passing into brownish black; tibiae pale brown, the tips narrowly darkened; tarsi black. Wings with a pale yellow tinge, clearer yellow at bases; veins brown to dark brown, distinct. Venation: Supernumerary crossvein in cell R_3 generally lacking, rarely preserved; *m–cu* at or beyond the fork of *M*, in cases to more than one-half its length.

Abdomen dark brown, the relatively large hypopygium conspicuously paler, yellowish brown to pale brown, including the dististyles. Outer dististyle with a conspicuous tubercle on mesal face near base, this weakly tuberculate at tip; inner dististyle with a series of strong tubercles along upper surface, as in *sparsimacula*.

Habitat. WYOMING. *Holotype:* ♂, West slope of Grand Tetons, near Teton Canyon, Targhee National Forest, June 27, 1953, swept from Douglas Fir (C. P. Alexander). *Allotopotype:* ♀, pinned with type. *Paratopotypes:* 3 ♂♀.

Although closely allied to *Dactylolabis sparsimacula* Alexander, of the Cascade Mountains Region, I must regard this fly as being specifically distinct. The pale hypopygium of the male is unusually conspicuous.

Erioptera (Psiloconopa) pahasapa new species

Size small (wing 4.5 mm. or less); general coloration of body and appendages black, the thoracic pleura more pruinose; halteres yellow; legs black; wings strongly darkened, the base and a discal area pale; vein *2nd A* straight; male hypopygium with a single deeply forked dististyle; inner gonapophysis a long straight spine with its outer margin microscopically spinulose.

♂. Length about 4.5–4.7 mm.; wing 4–4.2 mm.

♀. Length about 6.5 mm.; wing 4.5 mm.

Entire body, including appendages with the exception of the halteres, black, sparsely pruinose on sides of mesonotum and more heavily so on the thoracic pleura. Praescutal stripes more polished black. Halteres pale yellow, the base of stem narrowly infuscated, the knobs clearer yellow. Wings strongly darkened, the prearcular field and a major blotch at and before cord whitened; cell *Sc* and base of *C* more yellowed; stigma narrow, darker brown; veins brown, paler in the yellowed fields. Venation: Cell M_2 open by the atrophy of *m*; vein *2nd A* short and straight, the anal veins divergent.

Male hypopygium large, more polished black; ninth tergite transverse, the posterior border shallowly emarginate. Basistyle produced beyond the point of insertion of the dististyle as a conical point. Dististyle single but forking beyond base into two arms, the outer a slender blackened spine, its tip acute, the inner arm a compressed-flattened blade, the tip narrowly obtuse. Gonapophyses of either side very unequal, the outer appearing as a minute simple black spine, the inner apophysis larger, blackened, narrowed into a long straight spine, the outer margin microscopically spinulose.

Habitat. South Dakota. *Holotype:* ♂, Near Hill City, Black Hills, along small stream with beaver dams, June 17, 1953 (C. P. Alexander). *Allotopotype:* ♀. *Paratopotype:* 1 ♂.

The derivation of the name is from the Sioux, *paha* meaning Hills, *sapa* meaning Black. In its venation the fly is most like *Erioptera* (*Psiloconopa*) *painteri* Alexander, the coloration, particularly of the wings, being quite different.

Molophilus (Molophilus) xanthus new species

Belongs to the *gracilis* group, *pubipennis* subgroup; general coloration of body and wings yellow; antennae (male) short, pale basally; tips of femora and tibiae suddenly darkened; male hypopygium with the outer dististyle beyond midlength bent at a right angle, the lower or concave face with microscopic denticles; phallosome conspicuously hairy.

♂. Length about 4.5 mm.; wing 5.5 mm.; antenna about 1 mm.

Rostrum yellow; palpi brown. Antennae (male) with basal segments yellow, the outer ones brown; antenna short, flagellar segments long-oval, the outer verticils longest. Head yellow.

Thoracic dorsum fulvous yellow, the posterior sclerites and the pleura paler yellow. Halteres yellow. Legs yellow, the tips of the femora dark brown, on the posterior legs including about the outer eighth or ninth; tibial tips more narrowly blackened; tarsi passing into brownish black. Wings clear yellow, more saturated along the costal border; veins deeper yellow. Venation: R_2 lying shortly basad of level of *r–m;* petiole of cell M_3 nearly twice the oblique *m–cu;* vein *2nd A* long, very slightly arcuate.

Abdomen yellow, the hypopygium more intensely so. Male hypopygium with the dorsal lobe of basistyle relatively long and slender, the apex rounded, glabrous; mesal lobe with the apex produced, provided with abundant delicate setulae; spines relatively short and stout, about 22 in number. Outer dististyle bent at a right angle beyond midlength, terminating in an acute spine, the lower or concave face with microscopic denticles back to the bend; outer face at near midlength with a few long setae; inner dististyle shorter, the apex extended into a long gently curved spine, the surface rather sparsely spiculose or squamose. Phallosome conspicuously hairy.

Habitat. WASHINGTON. *Holotype:* Lewis and Clark State Park, Lewis County, July 17, 1953 (Alexander and Fender).

The most nearly allied species appears to be *Molophilus* (*Molophilus*) *spiculatus* Alexander, distinguished by the different color of the body and appendages and in slight differences of the male hypopygium. Superficially the fly is more like *M.* (*M.*) *perflaveolus* Alexander, which has the male hypopygium entirely different in structure.

Ichneumonid and Braconid Wasps Collected from Flowering Heads of Cat-tail, Typha latifolia L.

By W. W. Judd, University of Western Ontario, London, Ontario

In a communication previously published [1] the writer reported upon collections of the moth *Dicymolomia julianalis* Walker and its ichneumonid parasite, *Cremastus gracilipes* Cushman, from heads of cat-tail, *Typha latifolia,* taken from a swamp at London, Ontario, in 1952. With the intention of looking for more of the parasites, and perhaps of finding them ovipositing, a second visit to this swamp was made on the afternoon of August 23, 1953, a day of bright sunshine and a light westerly breeze. At this time the flowering heads of the cat-tail were well matured. The staminate flowers of the heads had dissipated, leaving only the bare rachis of the head at the top of each stalk. The pistillate portions of the heads each bore a firm cylindrical "cat-tail" of maturing flowers. Many of these were intact but most of them showed the effects of tunneling by larvae, typical of *Dicymolomia julianalis* and other borers in cat-tail heads, for patches and sinuous ridges of loosened flowers stood out above the surface of the brown compact mass of the pistillate head. The continued activity of the larvae would eventually lead to the loosening of all the flowers in a head, giving it the fluffed-out appearance of an infested head, as described by Claassen.[2]

During the afternoon of August 23 several hundred heads of cat-tail were scanned and any wasps seen moving over the surface of the heads were sucked up with an aspirator and placed in a poison jar. Three species of wasps were collected in this way, these being two ichneumonids, *Cremastus gracilipes* Cushman and *Scambus hispae* (Harris), and one braconid, *Apanteles* sp. The two ichneumonids were identified by Mr. G. S. Walley, Systematic Entomology, Science Service, De-

[1] Judd, W. W. 1954. Ent. News, 65: 73–75.

[2] Claassen, P. W. 1921. Cornell Univ. Agric. Exp. Stn. Mem. 47.

partment of Agriculture, Ottawa, and the braconid by Dr. W. R. M. Mason of the same organization. Unless otherwise stated, the specimens are retained in the collections of the University of Western Ontario.

Cremastus gracilipes Cushman. Three females of this species were collected. They were found moving slowly over patches or ridges of loosened flowers, the abdomen arched upward and the ovipositor probing into the mass of flowers. Two specimens have been deposited in the Canadian National Collection, Ottawa. Townes and Townes [3] list several Lepidoptera, including *Dicymolomia julianalis,* as hosts of this species of wasp.

Scambus hispae (Harris). Three females of this species were taken, these wasps being engaged in the same activity as *C. gracilipes.* One specimen is deposited in the Canadian National Collection. Townes and Townes [3] give a long list of Lepidoptera, including *Dicymolomia julianalis,* as hosts of this species.

Apanteles sp. These wasps were noticeable on the cat-tail heads from four or five yards distance because the folded wings of each wasp glistened in the sun, forming a bright oblong patch about one-quarter inch long on the surface of the head. If disturbed before capture a wasp would fly one or two inches from the head and whirl around it in rapid flight for a few seconds before resettling. The wasps moved rapidly over the surface of the heads, probing with their ovipositors. Twenty-nine female wasps were captured, four of these being deposited in the Canadian National Collection. Muesebeck and Walkley [4] list a considerable variety of larvae of Lepidoptera as hosts for species of *Apanteles.*

[3] Townes, H. and M. Townes. 1952. U. S. Dept. Agric., Agric. Monogr. No. 2.

[4] Muesebeck, C. F. W. and L. M. Walkley. 1952. U. S. Dept. Agric., Agric. Monogr. No. 2.

Entomological Departments

Believing such material to be of interest to its readers, ENTOMOLOGICAL NEWS herewith solicits articles similar to the one here presented and giving information on the organization and activities of entomologists in colleges, universities, museums, and in governmental and other groups.

Oregon State College

Entomology at Oregon State College has a dual setup. The Department of Entomology (teaching) is in the School of Science while the Department of Entomology (Experiment Station) is in the School of Agriculture. For practical purposes, however, both departments are one unit, have the same administrative head, use the same facilities, and many staff members have combined appointments.

The Department offers undergraduate work in entomology towards an A.B. or B.S. degree and graduate work towards a master's degree (A.M. or M.S.) and the doctor's degree (Ph.D.). In recent years the number of undergraduate majors has ranged from 5 to 10 while the number of graduate majors has ranged from 10 to 16 students.

At present the teaching staff is composed of Paul O. Ritcher, Ph.D., Wisconsin (Professor and Chairman of Department); W. J. Chamberlin, Ph.D., Stanford (Associate Professor); H. H. Crowell, Ph.D., Ohio State (Associate Professor); Charles H. Martin, Ph.D., Cornell (Associate Professor); Knud G. Swenson, Ph.D., California (Associate Professor); Leon C. Terriere, Ph.D., Oregon State (Associate Professor); William P. Stephen, Ph.D., Kansas (Assistant Professor); and Frank F. Hasbrouck, Ph.D., Illinois (Instructor and Curator).

Dr. Chamberlin covers the field of forest entomology and also teaches courses in nomenclature and literature, medical entomology, and historical entomology. Dr. Martin, whose special interests are ecology, biological control, and the taxonomy of Asilidae, teaches beginning entomology, aquatic entomology, insect ecology, biological control, morphology, and research principles.

Courses in fruit insects and the taxonomy of immature insects

are handled by Ritcher. Dr. Crowell teaches a course in insect physiology and another dealing with field and truck crop insects. Course work in insect transmission of plant viruses is given by Dr. Swenson.

The field of apiculture is handled by Dr. Stephen who also gives a course on the principles of systematics. Course work in insect toxicology is taught by Dr. Terriere who is also Associate Agricultural Chemist. Dr. Hasbrouck, in addition to his duties as Curator, teaches general entomology and beginning taxonomy.

The Department maintains a working collection of some 200,000 specimens, the majority of which belong to the orders Coleoptera, Hymenoptera, and Diptera. Although many of the insects are from Oregon, other parts of the world are well represented. Collections of the orders Thysanoptera and Siphonaptera are especially noteworthy, according to the Curator, Dr. Hasbrouck.

A separate entomological library is maintained in the Department for staff and student use. It contains bound sets of North American entomological journals, federal and state publications, working collections of catalogues and monographs for taxonomic studies, and collections of important works on insect morphology, biological control, aquatic insects, forest entomology, medical entomology, historical entomology, insecticides, and economic entomology. Other works dealing with entomology and many sets of foreign entomological journals are available in the College library.

Because of the Department's close ties with Experiment Station work in entomology, many research facilities are available for use by students and staff. The entomology farm, adjoining the campus, includes a modern apiculture laboratory, an insectary, fumigation equipment, and shop facilities. Six acres of crop land are used as a field laboratory for biological studies and small plot work.

A new entomology greenhouse was completed in the fall of 1954, which has automatic temperature control in each of several compartments. The department also has a well-equipped

chemical laboratory and an insect culture room for research and teaching in insect toxicology and insect physiology.

The Department is fortunate in being located in a region where there is much interest in entomology and where there are many other entomologists both professional and amateur. The Oregon Entomological Society with over a hundred members is closely affiliated with the Department. One of its projects is the promotion of a monograph series on insects of the Pacific Northwest.—PAUL O. RITCHER.

Reviews

TERRICOLE DIPTERENLARVEN, by Adolph Brauns. Pp. 179, 74 figures, 22 photographs, 3 plates, 3 tables. "Musterschmidt" Wissenschaftlicher Verlag, Gottingen, 1954. Price, DM 14.–.

The book begins with larval keys to the families of the soil-inhabiting Diptera. Some of the family names may appear a bit unusual but they seem to be the ones in current use by many European workers and present no particular problem. A few groups are taken out to subfamily level. The keys are far from simple but the nature of the subject is responsible, not the author. Reference in the keys to figures illustrating the characters used are very helpful.

Each group is discussed at the family level and the discussion is handled rather uniformly for each family with each subject heading in heavy type to aid quick reference. Among the subjects covered for each family are: common names, a general morphological and taxonomic discussion, ecology, biology, and brief reference to some characters used to separate certain genera and species. In some families, discussion is broken down to subfamily level and in a few cases individual genera are covered in detail. Something of an innovation is the list of common names in several languages, mostly North European. The common names listed, however, in most cases refer to the adult rather than the larva.

Separate chapters are devoted to biological and morphological detail but the real heart of the book is the well organized discussion at the family level.

This book is essentially a handbook and as such is a valuable asset not only as a quick reference for the worker specifically

interested in Diptera but possibly is even more valuable to workers in other fields where contact with Dipterous larvae is incidental. It is not a heavy or wordy tome but a condensation of most of the European and considerable American literature, apparently tied together by the results of the author's own researches. The style is brief—almost telegraphic. This terse style will be welcomed especially by those whose German is a bit on the weak side and to whom it is a chore to wade through lines of print to find a small nugget hidden there.

All the figures and most of the photographs are excellent. A few of the photographs and the three-colored plates leave a little to be desired. It is noted that a majority of the figures are original and in themselves are a valuable contribution to the subject covered.—L. L. PECHUMAN.

INSECT FACT AND FOLKLORE. By Lucy W. Clausen. The Macmillan Company, New York, 1954. Pp. xiv + 194. Price, $3.50.

This is not a large book (194 pages, including a selected bibliography and index), yet because of the concise factual style in which it is written it presents a wealth of interesting (and important) facts about the lives of insects, and many of the superstitions and folklore that have developed about them in various parts of the world, including their use as food and in medicine. Its style and language are completely adult—it does not hesitate to use such words as "antenna" and "ovipositor"—and yet it may be enjoyed by young folks as well. It avoids anthropomorphisms and other rhetorical devices that are mistakenly believed by many authors and editors to appeal to the popular taste.

The author, Dr. Lucy W. Clausen, by reason of her training and her experience, is eminently qualified to write just such a book. She is at present in the Department of Public Instruction at the American Museum of Natural History, and Lecturer at the College of Pharmacy, Columbia University. For several years she was heard weekly on a science program over the radio, and has been active in various other projects in developing public interest in insects.

Every entomologist will find here some facts and folklore that are new to him and fascinating; he will also find it a good book to present to members of his family.—R. G. SCHMIEDER.

NOTICE. The December 1954 issue of ENTOMOLOGICAL NEWS was mailed at the Post Office at Lancaster, Pa., on December 2, 1954.

EXCHANGES

This column is intended only for wants and exchanges, not for advertisements of goods for sale or services rendered. Notices not exceeding three lines free to subscribers.

These notices are continued as long as our limited space will allow; the new ones are added at the end of the column, and, only when necessary those at the top (being longest in) are discontinued.

American Sarcophagidae—wanted for identification. H. R. Dodge, P.O. Box 185, Chamblee, Georgia.

German lepidopterist wishes to correspond and receive live material (eggs and pupae) in exchange for dried imagoes. Johannes Reichel, Koenigsberg, Krs. Wetzlar 16, Germany.

For exchange—The periodic Cicada, T. septendecim. Desire Lepid., espec. Papil., Sphing. & Speyeria. Also Col., espec. Ceramb. & Lucan. John W. Morris, 2704 Genesee St., Syracuse 9, N. Y.

Cynipid and Itonidid galls—American species wanted; purchase or exchange for British species. Fresh or dried. D. Leatherdale, F.R.E.S., Old Woodstock, Oxford, England.

Wanted—Reprints or papers concerning insects taken in Alaska for inclusion in list of Alaskan insects. R. H. Washburn, Alaska Experiment Station, Palmer, Alaska.

Conopidae of the World wanted. Will pay 10¢ to $1.00 for pinned and labelled specimens. S. Camras, 4407 N. Milwaukee Ave., Chicago 30, Illinois.

Anisoptera—Nearctic sp. wanted for exchange, espec. Ophiog., Arigom., Aeschna, Neurocor., Somatoc., Cordulia, Dorocor., Leucor. R. D. Cuyler, Dept. of Entomology, N. C. State College, Raleigh, N. C.

Bembicini and Stizini (Hym., Sphec.) of New World wanted for revis. study. Will return upon request or at end of project. James E. Gillaspy, Dept. of Zoology, Univ. Texas, Austin 12, Texas.

Agapema galbina. Will exchange cocoons of this moth for nature books. E. Frizzell, Route 4, Box 96, San Benito, Texas.

Wanted—Data on exact location of colonies of *Epibembex* (olim *Bembix*) (Hymenoptera), any species, any part of country, for biological studies. Howard E. Evans, Dept. Entomology, Cornell Univ., Ithaca, N. Y.

Fanniinae wanted on loan (nearctic and holarctic), and information on collections. James G. Chillcott, Dept. Entom., Univ. of Kansas, Lawrence, Kan. (Loans may be charged to Dr. C. D. Michener.)

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